United Kingdom of Great Britain and Northern Ireland

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BS NA EN 1995-1-1 (2008) (English): UK National Annex to Eurocode 5. Design of timber structures. General. Common rules and rules for buildings

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NA to BS EN 1995-1-1:2004+A1:2008

Incorporating National Amendment No. 1

NATIONAL ANNEX

UK National Annex to Eurocode 5: Design of timber structures –

Part 1-1: General – Common rules and rules for buildings

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A1	31 October 2009	Addition of **6.1.7**(2) in Scope, insertion of new subclause **NA.2.5** and new Table NA.4; see introduction.

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Summary of pages

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National Annex NA (informative) to BS EN 1995-1-1:2004+A1:2008, Eurocode 5: Design of timber structures – Part 1-1: General – Common rules and rules for buildings

Introduction

This National Annex has been prepared by BSI Subcommittee B/525/5, *Structural use of timber*. In the UK it is to be used in conjunction with BS EN 1995-1-1 for the design of timber structures, together with BS EN 1990 and BS EN 1991 and their National Annexes.

This National Annex has been updated to reflect Amendment A1:2008 to BS EN 1995-1-1:2004. The start and finish of text introduced or altered by Amendment No. 1 is indicated in the text by tags [A1⟩ ⟨A1]. Minor editorial changes including the renumbering of subclauses and tables have not been tagged.

NA.1 Scope

This National Annex gives:

a) the UK decisions for the Nationally Determined Parameters described in the following subclauses of BS EN 1995-1-1:2004+A1:2008:

- **2.3.1.2**(2)P
- **2.3.1.3**(1)P
- **2.4.1**(1)P
- [A1⟩ **6.1.7**(2) ⟨A1]
- **6.4.3**(8)
- **7.2**(2)
- **7.3.3**(2)
- **8.3.1.2**(4)
- **8.3.1.2**(7)
- **9.2.4.1**(7)
- **9.2.5.3**(1)
- **10.9.2**(3)
- **10.9.2**(4)

b) the UK decisions on the status of BS EN 1995-1-1:2004+A1:2008 informative annexes;

c) reference to non-contradictory complementary information.

NA.2 Nationally Determined Parameters

NA.2.1 Assignment of loads to load-duration classes [BS EN 1995-1-1:2004+A1:2008, 2.3.1.2(2)P]

BS EN 1995-1-1:2004+A1:2008, Table 2.2 is implemented nationally by using Table NA.1.

Table NA.1 **Load-duration classes**

Load-duration class	Duration	Examples of loading
Permanent	More than 10 years	Self-weight
Long-term	6 months to 10 years	Storage loading (including in lofts), water tanks
Medium-term	1 week to 6 months	Imposed floor loading
Short-term	Less than 1 week	Snow, maintenance or man loading on roofs, residual structure after accidental event
Instantaneous		Wind, impact loading, explosion

NA.2.2 Assignment of timber constructions to service classes [BS EN 1995-1-1:2004+A1:2008, 2.3.1.3(1)P]

BS EN 1995-1-1:2004+A1:2008, **2.3.1.3**(1)P is implemented nationally for common timber constructions by using Table NA.2.

Table NA.2 **Service classes**

Type of construction	Service class
Cold roofs	2
Warm roofs	1
Intermediate floors	1
Ground floors	2
Timber-frame walls, internal and party walls	1
Timber-frame walls, external walls	2
External uses where member is protected from direct wetting	2
External uses, fully exposed	3

NA.2.3 Partial factors for material properties [BS EN 1995-1-1:2004+A1:2008, 2.4.1(1)P]

BS EN 1995-1-1:2004+A1:2008, Table 2.3 is implemented nationally by using Table NA.3.

Table NA.3 **Partial factors γ_M for material properties and resistances**

Fundamental combinations	
Solid timber, untreated	1,3
Solid timber, preservative-treated	1,3
Glued laminated timber	1,25
LVL, plywood, OSB	1,2
Particleboard	1,3
Fibreboards, hard	1,3
Fibreboards, medium	1,3
Fibreboards, MDF	1,3
Fibreboards, soft	1,3
Connections (except for punched metal plate fasteners)	1,3
Punched metal plate fasteners, anchorage strength	1,3
Punched metal plate fasteners, plate (steel) strength	1,15
Accidental combinations	1,0

NA.2.4 Tensile stresses perpendicular to grain in double tapered, curved and pitched cambered beams [BS EN 1995-1-1:2004+A1:2008, 6.4.3(8)]

The tensile stresses perpendicular to grain in double tapered, curved and pitched cambered beams should be evaluated using BS EN 1995-1-1:2004+A1:2008, Expression 6.54.

A1 NA.2.5 Modification factor for influence of cracks on shear resistance [BS EN 1995-1-1:2004+A1:2008, 6.1.7(2)]

BS EN 1995-1-1:2004+A1:2008, **6.1.7**(2) is implemented nationally by using values for the modification factor, k_{cr}, given in Table NA.4.

Table NA.4 **Value of modification factor, k_{cr}**

Material	Modification factor k_{cr}
Solid timber	0.67
Glued laminated timber	0.67
Laminated veneer lumber (LVL)	1.0
Wood-based panels	1.0

A1

NA.2.6 Limiting values for deflections of beams [BS EN 1995-1-1:2004+A1:2008, 7.2(2)]

As stated in BS EN 1990:2002, **A1.4.2**(2), the serviceability criteria should be specified for each project and agreed with the client. The values in Table NA.5, which take into account creep deformations, are given for guidance.

Table NA.5 **Limiting values for deflections of individual beams**

Type of member	Limiting value for net final deflections of individual beams, $w_{net,fin}$	
	A member of span, ℓ between two supports	A member with a cantilever, ℓ
Roof or floor members with a plastered or plasterboard ceiling	$\ell/250$	$\ell/125$
Roof or floor members without a plastered or plasterboard ceiling	$\ell/150$	$\ell/75$

*NOTE When calculating $w_{net,fin}$, w_{fin} should be calculated as u_{fin} in accordance with BS EN 1995-1-1:2004 + A1:2008, **2.2.3**(5).*

NA.2.7 Vibrations in residential floors [BS EN 1995-1-1:2004+A1:2008, 7.3.3(2)]

*NOTE For the value of the modal damping ratio, ζ, in BS EN 1995-1-1:2004 + A1:2008, **7.3.1**(3), a value of 0,02 has been found appropriate for typical UK floors.*

NA.2.7.1 BS EN 1995-1-1:2004+A1:2008, **7.3.3**(2) is implemented nationally by using Table NA.6.

Table NA.6 **Limits for a and b in BS EN 1995-1-1:2004+A1:2008 expressions (7.3) and (7.4)**

Parameter	Limit	
a, deflection of floor under a 1 kN point load	1,8 mm $16\,500/\ell^{1,1}$ mm where ℓ = joist span in mm	for $\ell \leqslant 4\,000$ mm for $\ell > 4\,000$ mm
b, constant for the control of unit impulse velocity response	for $a \leqslant 1$ mm for $a > 1$ mm	$b = 180 - 60a$ $b = 160 - 40a$

NOTE The formulae for b correspond to BS EN 1995-1-1:2004 + A1:2008, Figure 7.2. With a value of 0,02 for the modal damping ratio, ζ, the unit impulse velocity response will not normally govern the size of floor joists in residential timber floors.

NA.2.7.2 The recommended limit on a may be compared with a corresponding floor deflection calculated as:

$$\frac{1\,000\,k_{\text{dist}}\,\ell_{\text{eq}}^{\,3}\,k_{\text{amp}}}{48(EI)_{\text{joist}}} \leq a \text{ mm} \qquad \text{(NA.1)}$$

where

k_{dist} = proportion of point load acting on a single joist

ℓ_{eq} = equivalent floor span in mm

k_{amp} = amplification factor to account for shear deflections in the case of solid timber and glued thin-webbed joists or joint slip in the case of mechanically-jointed floor trusses

$(EI)_{\text{joist}}$ = bending stiffness of a joist in Nmm² (calculated using E_{mean})

where

$$k_{\text{dist}} = \max\begin{cases} k_{\text{strut}}\left[0{,}38 - 0{,}08\ln[14EI_b / s^4]\right] \\ 0{,}30 \end{cases}$$

k_{strut} = 0,97 〈A1〉 only in the case of solid timber joists which have a transverse stiffness provided by single or multiple lines of herringbone strutting, or blocking with a depth of at least 75% the depth of joists, in addition to that provided by the decking/ceiling, otherwise 1,0 〈A1〉

$(EI)_{\text{b}}$ = floor flexural rigidity perpendicular to the joists in Nmm²/m

s = joist spacing in mm

ℓ_{eq} = span, ℓ, in mm, for simply supported single span joists

= 0,9ℓ for the end spans of continuous joists

= 0,85ℓ for the internal spans of continuous joists

k_{amp} = 1,05 for simply-supported solid timber joists

= 1,10 for continuous solid timber joists

= 1,15 for simply-supported glued thin-webbed joists

= 1,30 for continuous glued thin-webbed joists

= 1,30 for simply-supported mechanically-jointed floor trusses

= 1,45 for continuous mechanically-jointed floor trusses.

$(EI)_{\text{b}}$ is calculated as the flexural rigidity of the floor decking perpendicular to the joists, using E_{mean} for E. Discontinuities at the edges of floor panels or the ends of floor boards may be ignored.

$(EI)_b$ may be increased by adding the flexural rigidity of plasterboard ceilings fastened directly to the soffit of the floor joists, assuming $E_{plasterboard} = 2\ 000 N/mm^2$.

$(EI)_b$ may be increased for open web joists with a continuous transverse bracing member fastened to all the joists within $0{,}1\ell$ of mid-span, by adding the bending stiffness of the transverse member in Nmm^2 divided by the span ℓ in metres. A1 Also $(EI)_b$ may be increased for open web joists with two continuous transverse bracing members of equal cross-section and grade fastened to all the joists within $0{,}05\ell$ of one-third span points, by adding the bending stiffness of one of the transverse members in Nmm^2 divided by the span, ℓ, in metres. A1

The fundamental frequency f_1 should not be less than 8 Hz unless a special investigation is made. In BS EN 1995-1-1 expression 7.5 the mass of the floor should be the permanent actions only without including partition loads or any variable actions.

In calculating the equivalent plate bending stiffness (EI) of floors, in which the decking is adhesively bonded to the joists, no allowance should be made for composite action unless the floor is designed in accordance with **9.1.2** and with adhesives meeting the requirements of **3.6** and the detailing and control provisions of **10.3**.

NA.2.8 Lateral load-carrying capacity of nails in end grain [BS EN 1995-1-1:2004+A1:2008, 8.3.1.2(4)]

The application rules of BS EN 1995-1-1:2004+A1:2008, **8.3.1.2**(4) should be used to determine the lateral load-carrying capacity of nails in end grain.

NA.2.9 Species sensitive to splitting in nailed joints [BS EN 1995-1-1:2004+A1:2008, 8.3.1.2(7)]

The application rules of BS EN 1995-1-1:2004+A1:2008, **8.3.1.2**(7) should not be applied to nailed joints.

NA.2.10 Racking resistance of wall diaphragms [BS EN 1995-1-1:2004+A1:2008, 9.2.4.1(7)]

The racking resistance of wall diaphragms should be evaluated by Method B.

A1 *NOTE PD 6693-1-1 is currently under development. It is anticipated that it will include an alternative to Method B, based on Method A.* A1

NA.2.11 Modification factors for bracing systems [BS EN 1995-1-1:2004+A1:2008, 9.2.5.3(1)]

BS EN 1995-1-1:2004+A1:2008, Table 9.2 is implemented nationally by using Table NA.7.

Table NA.7 **Values of modification factors for bracing systems**

Modification factor	Value
k_s	4
$k_{f,1}$	60
$k_{f,2}$	100
$k_{f,3}$	50 (members spaced at $\leqslant$ 600 mm) 40 (members spaced at > 600 mm)

NA.2.12 Erection tolerances for trusses: maximum bow [BS EN 1995-1-1:2004+A1:2008, 10.9.2(3)]

The maximum bow permitted in any truss member after erection should be 10 mm.

NA.2.13 Erection tolerances for trusses: maximum deviation from vertical alignment [BS EN 1995-1-1:2004+A1:2008, 10.9.2(4)]

The maximum permitted deviation (in mm) of a truss, $a_{dev,perm}$, from true vertical alignment is given in Equation NA.2.

$$a_{dev,perm} = \min\begin{cases} 10 + 5(H-1) \\ 25 \end{cases} \quad \text{(NA.2)}$$

where

H is the height of truss (m).

NA.3 Guidance on using informative annexes

NA.3.1 Block shear and shear plug failure at multiple dowel-type steel-to-timber connections [BS EN 1995-1-1:2004+A1:2008, Annex A]

BS EN 1995-1-1:2004+A1:2008, Annex A should only be used for connections containing 10 or more dowel-type fasteners of diameter $\leqslant$ 6 mm in line parallel to grain or containing 5 or more dowel-type fasteners of diameter > 6 mm in line parallel to grain.

NA.3.2 Mechanically jointed beams [BS EN 1995-1-1:2004+A1:2008, Annex B]

BS EN 1995-1-1:2004+A1:2008, Annex B may be used.

NA.3.3 Built-up columns [BS EN 1995-1-1:2004+A1:2008, Annex C]

BS EN 1995-1-1:2004+A1:2008, Annex C may be used.

NA.4 Reference to non-contradictory complementary information

〈A1〉 The following reference contains non-contradictory complementary information for use with BS EN 1995-1-1:2004+A1:2008.

PD 6693-1-1, *Guidance to Eurocode 5: Design of timber structures – Part 1: General – Common rules and rules for buildings.*
(In preparation.) 〈A1〉

Bibliography

Standards publications

For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

A1 PD 6693-1-1, *Guidance to Eurocode 5: Design of timber structures – Part 1: General – Common rules and rules for buildings.* (In preparation.) A1

BS EN 1990:2002, *Eurocode – Basis of structural design.*

BS EN 1991 (all parts), *Eurocode 1 – Actions on structures.*

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